



CARDD
MEPA ROUTING MEMO


To: Mark Bostrom
Through: Demi Blythe
From: Heidi Anderson-Folnagy

Re: No MEPA Needed Decision for RDG Planning Grant
Project Sponsor: Beaverhead Conservation District with Big Hold Watershed Committee
Name of Project: Elkhorn Mine & Mill Bioabsorbent Filtration of Acid Mine Drainage (AMD)
Agreement No: RITP-22-

Memo:

DNRC can issue a No MEPA Needed – Categorical Exclusion Decision Memo for the Beaverhead Conservation District Elkhorn Mine & Mill Bioabsorbent Filtration of Acid Mine Drainage (attached). We used the CATEX Checklist to determine the project's eligibility to be categorized under the ARM 36.17.614 Categorical Exclusion Rule.

SIGNATURE REQUIRED on BOTH the NO MEPA Decision and Checklist.


_____ MEPA/NEPA Coordinator Review


_____ Bureau Chief Review


_____ Division Administrator Signature

_____ Post for _30_ Days on DNRC's Environmental Docs page.

_____ File

DEPARTMENT OF NATURAL RESOURCES
AND CONSERVATION

GREG GIANFORTE, GOVERNOR

1539 ELEVENTH AVENUE

STATE OF MONTANA

DIRECTOR'S OFFICE: (406) 444-2074
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HELENA, MONTANA 59620-1601DECISION MEMO
CATEGORICAL EXCLUSION

Elkhorn Mine & Mill Bioabsorbent Filtration of Acid Mine Drainage (AMD)
November 2021
Beaverhead Conservation District with Big Hole Watershed Committee
45.494637, -113.041870
Beaverhead County

PURPOSE AND NEED

The Beaverhead Conservation District (BCD) – in partnership with the Big Hole Watershed Committee (BHWC), the USFS, the Beaverhead-Deer Lodge National Forest (BDLNF), and Montana Fish, Wildlife, & Parks (MFWP) – seeks to design and install a demonstration project for bioabsorbent filtration of AMD at the Elkhorn Mine & Mill. This project will be put into action on an active mine site and add an innovation in an effort to make progress on designing a remedy and restoration for public resources damaged by historic underground hard rock mining and is designed to address water quality, human health, and habitat issues related to heavy metals contamination. The Elkhorn Mine & Mill sits alongside Elkhorn Creek, a headwater tributary of the Wise River, which feeds into the Big Hole River approximately 21 miles north of the project site.

As a state Superfund site under the jurisdiction of the BDLNF, the Elkhorn Mine & Mill underwent reclamation and remediation efforts to remove the human health and environmental hazards existing at the site (see Appendix A). Phase I (circa 1998) of the reclamation efforts focused on removal of waste rock dumps and mine tailings to a capped on-site repository. Phase II (2001) addressed the residual mine tailings in the floodplain and reconstructed the abandoned Elkhorn Creek stream channel to a more naturally functioning system. Phase III (2005) removed the mill tailings and contaminated building materials associated with demolished structures. Phase IV (2005) assessed the safety concerns of the 1,000' mine adit (entrance) and stabilized the facility to reduce public endangerment. Funding from litigation settlements with Primary Responsible Parties has been exhausted, and the site remains unrestored despite these efforts. Moreover, ongoing contamination in exceedance of aquatic life standards (Montana DEQ, 2019) has been documented by the Montana Bureau of Mines & Geology (MBMG, 1998; see Appendix B) and Montana Tech (Gammons, 2009; see Appendix C). In 2020 project partners completed a soils and metals characterization, including a LIDAR flight of the area (DNRC, 2021; see Appendix D), with RDGP grant funding. That effort catalyzed funding from USFS and a WaterSMART grant from Bureau of Reclamation (in contracting) to design a remedy for the site.

The project partners propose to add value to the planned remedy by piloting a fungal biosorption filtration system for AMD. The use of microbes for heavy metal accumulation was first reported in the early 1980s. Since then, numerous research reports have revealed each and every aspect of biosorption including selection of biosorbents, exploring the mechanisms involved, physiochemical conditions affecting the process and requirements that are needed to transfer the process from the lab to the field (Dhankhar, R., Hooda, A. 2011).

Despite the continuing increase in published research on biosorption, there has been little or no utilization in an industrial context. Biosorption can be defined as the passive uptake of toxicants by dead/inactive biological materials or materials derived from biological sources. The biosorption process involves a solid phase (biosorbant) and a liquid phase (normally water) containing dissolved species to be sorbed (sorbate: metal ions). The mechanism for biosorption that will be used for the Elkhorn site is based on the physicochemical interactions between the metal ions and the functional groups present on the fungal cell surface, an ion exchange system.

Many types of biomaterial have good biosorption potential towards all types of metal ions. Plant biosorbents, which will be paired with *Rhizopus* fungal species, are cost effective and available in Montana include agricultural byproducts such as maize cob and husk, sugar beet pulp, and wheat bran. It has been documented (Volesky, B., Holan, Z.R. 1995) that multiple species of the fungal genus *Rhizopus* can readily uptake all metals and metalloids (As, Ca, Cu, Mg, Mn, Pb, Ag, Zn,) found at the Elkhorn mine and mill site.

The research carried out in the area of fungal biosorption suggests it to be the ideal alternative for decontamination of metal-containing effluents as it offers several advantages over conventional methods. Firstly, fungus shows excellent metal-binding capacity and efficiency because of the number and variety of functional groups present. Fungal cell-walls are efficient due to large surface area and a high percentage of chitin-based cell-wall material. Secondly, fungus is easy to cultivate at large scale as it has a short multiplication cycle and a high yield. Moreover, it can be grown using inexpensive growth media (agricultural waste products) using unsophisticated technology. Thirdly, most fungal biosorbants are non-pathogenic and naturally occurring in the environment. The fungal species that we will be screening are in the *Rhizopus* genus and occur naturally in soils worldwide.

The biosorption process that Montana BioAgriculture Inc. will design in their lab and deploy in the field utilizes a continuous flow cylindrical column packed bed system. The continuous flow biosorption system is viewed as one of the most technologically feasible, economical, and effective methods especially when combined with a packed/fixed bed column (Dhankhar, R., Hooda, A. 2011). The packed bed column allows for the most efficient use of the fungal surface area and sorbent potential while also presenting an ability to scale-up the operation. The kinetics of metal reaction to the fungal biosorbant is fast, previous research has indicated that the metal biosorption occurs within a matter of 5-15 min after contact (Volesky, B., Holan, Z.R. 1995).

The laboratory design stage will compare two agricultural waste products corn cob chunks with husk and sugar beet pulp. Both of these products also have mild biosorption potential, pack tightly into a fixed bed column and are an excellent substrate for *Rhizopus* fungal cultures. The lab design stage will determine column length, void volumes, flow rates and number of columns needed due to differing saturation rates depending on metal concentrations and particulate matter within the AMD water. When a biosorbant column becomes fully saturated with concentrated metals it will need to be switched to another column. The design will look at the metal concentration, metal ion charge and affinity. The higher charged metals will be removed first, such as lead and cadmium, along with most large particulate matter. Utilizing multiple columns in stages would allow less charged metals to be recovered down gradient without the need to change or clog as frequently. The fully saturated metal laden columns could be disposed of in a landfill or emptied into a low heat/ash furnace to burn off the biomass and be left with manageable quantities of toxins. There is also the potential to recover profitable metals, which will be explored as part of final remedy design in the future.

The proposed project site resides entirely within the BDLNF, extending from 500' upstream of the waste rock dump to approximately 1 mile downstream, spanning the valley floor and adjacent slopes (Figure 1 in attached document). This includes the most degraded areas as well as unimpaired (reference) conditions, encompassing the footprint of all previous reclamation and remediation efforts. The 1,000' adit is at the southernmost corner (uphill) of the waste rock dump and repository (Figure 2), discharging up to 150 gallons per minute of heavily-contaminated groundwater from the mine (Figure 3). From the adit, contaminated water flows through the site and into several settling basins before discharging into shallow groundwater and Elkhorn Creek. Investigations in 2009 (Gammons) also identified diffuse contaminant inputs to Elkhorn Creek near the old mill site (Figure 4), which was partially demolished in 2005 (Figure 5).

The overarching goal of this planning grant project is to demonstrate a remedial technique to be incorporated into a larger remediation project to achieve the highest level of ecological cleanup feasible for the site. The secondary goal is to provide innovation to the field of AMD remediation by incorporating a biological component and a one-of-a-kind pilot project on an active mine site.

Project objectives are to:

- Initial lab scale feasibility and design study that will lead to designing and installing an on-site pilot bioabsorbent filtration system for portion of surface water coming from 1000' adit.
- Provide designs, constraints and estimates for biosorbent filtration potential of Rhizopus fungal biosorbents on agricultural waste products. Coordinate with USFS, BDLNF, MFWP, and other stakeholders for planning and investigative support.
- Administer the contract, subcontracts and reporting to DNRC

Explanation of the decision(s) that must be made regarding the proposed action (i.e. approve grant or loan and provide funding):

DNRC will approve the grant to provide funding for the Elkhorn Mine & Mill Bioabsorbent Filtration of Acid Mine Drainage Project.

DNRC is not required to prepare an Environmental Assessment (EA) or an Environmental Impact Statement (EIS) for actions that qualify for a CATEGORICAL EXCLUSION (ARM 36.17.614) or justified by a PROGRAMMATIC REVIEW; or are ACTIONS OF A SPECIAL NATURE (ARM 36.2.523(5)); or are EMERGENCIES (ARM 36.2.539). These actions are subject to review for EXTRAORDINARY CIRCUMSTANCES that would require an EA or an EIS.

ACTIONS OF SPECIAL NATURE (ARM 36.2.523)

- ☐ Administrative actions: routine, clerical or similar functions of a department, including but not limited to administrative procurement, contracts for consulting services, and personnel actions.
- ☐ Minor repairs, operations, or maintenance of existing equipment or facilities.

☐ Investigation and enforcement: data collection, inspection of facilities or enforcement of environmental standards.

☐ Ministerial actions: actions in which the agency exercises no discretion, but rather acts upon a given state of facts in a prescribed manner.

☐ Actions that are primarily social or economic in nature and that do not otherwise affect the human environment.

CATEGORICAL EXCLUSION/PROGRAMMATIC REVIEW

☒ Categorical Exclusion (CE) refers to a type of action which does not individually, collectively, or cumulatively require an EA or EIS, as determined by rulemaking or programmatic review adopted by the agency, unless extraordinary circumstances, as defined by rulemaking or programmatic review, occur. This project qualifies under ARM 36.17.614 CATEGORICAL EXCLUSIONS.

☐ Programmatic review means an analysis (EIS or EA) of the impacts on the quality of the human environment of related actions, programs, or policies. DNRC – CARDD does not have any programmatic reviews completed at the time of this template.

The project listed above meets the definition of Actions of a Special Nature, Categorical Exclusion or Programmatic Review including specified conditions and Extraordinary Circumstances. Included below is a supplemental checklist verifying the use of the Categorical Exclusion.

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|---------------------|---|-------------------------|
| Prepared By: | Name: Demitra Blythe Title: CARD Division MEPA Coordinator | Date: 10/19/2021 |
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| Approved By: | Name: Mark Bostrom Title: CARD Division Administrator |
| Signature: | <i>Mark W Bostrom</i> <small>DocuSigned by: BF7A1C50B2AF4DE...</small> |
| Date: 10/22/2021 3:28:14 PM MDT | |

MAPS AND FIGURES



DNRC CARDD DOCUMENTATION OF CATEGORICAL EXCLUSION DETERMINATION CHECKLIST

Project Name: Elkhorn Mile and Mill Bioabsorbent Filtration of Acid Mine Drainage (AMD)

Brief Description: The Beaverhead Conservation District (BCD) – in partnership with the Big Hole Watershed Committee (BHWC), the USFS, the Beaverhead-Deer Lodge National Forest (BDLNF), and Montana Fish, Wildlife, & Parks (MFWP) – seeks to design and install a demonstration project for bioabsorbent filtration of AMD at the Elkhorn Mine & Mill.

Agreement Number: RITP-22-

Date: 10/19/2021

Preparer: Demi Blythe – DNRC CARDD MEPA Coordinator

The Department of Natural Resources and Conservation action under 36.17.614, is excluded from the requirement to prepare an environmental assessment (EA) or environmental impact statement (EIS) if the application for department review is for any of the following projects:

(a) Projects relating to existing infrastructure systems such as sewer and septic systems, drinking water supply systems, and stormwater systems, including combined sewer overflow systems, dams, culverts, headgates, canal lining, siphons, pipelines, pump sites, lift stations, irrigation infrastructure, that involve:
[Answer yes or no. If all answers “no”, an EA or EIS must be completed. If any answer is yes, skip to (b).]

1. No - Minor upgrading; or
2. No - Minor expansion of system capacity; or
3. No - Rehabilitation (including functional replacement) of the existing system and system components; or
4. Yes - Construction of new minor ancillary facilities adjacent to or on the same property as existing facilities; or
5. No - Projects in unsewered communities involving the replacement of existing on-site systems, provided that the new on-site systems do not result in substantial increases in the volume of discharges or in loadings of pollutants from existing sources, and do not relocate existing discharges; or
6. No - Use of sampling and monitoring wells to test for the presence of contaminants such as, but not limited to, metals and petroleum; or
7. Yes - Activities that do not involve or lead directly to construction, such as planning studies, scientific research and analysis, surveys, or engineering.

(b) A categorical exclusion may NOT be granted for a department action if:

[Answer yes or no. If all answers "no", skip to (c). If any answer is yes, an EA or EIS must be completed.]

1. No - The action would authorize facilities that will provide a new discharge or relocate an existing discharge to ground or surface waters;
2. No - The action would result in an increase above permit levels established for the facility under the Montana pollutant discharge elimination system or Montana ground water pollution control system for either volume of discharge or loading rate of pollutants to receiving waters;
3. No - The action would authorize facilities that will provide capacity to serve a population at least 30% greater than the existing population;
4. No - The action is not supported by the state, or other regional growth plan or strategy;
5. No - The action directly or indirectly involves or relates to upgrading or extending infrastructure systems primarily for the purposes of future development;
6. No - The department has received information indicating that public controversy exists over the project's potential effects on the quality of the human environment;
7. No - The department determines that the proposed project that is the subject of the state action shows some potential for causing a significant effect on the quality of the human environment, based on ARM 36.2.524, or might possibly affect:
 - (i) sensitive environmental or cultural resource areas; or
 - (ii) endangered or threatened species and their critical habitats.

(c) If the proposed project meets the conditions above in determining use of a CATEX, the

reviewer will then complete items below as follows:

[Once all steps are complete, reviewer shall sign and date at bottom. If revocation becomes necessary, reviewer shall initiate an EA or EIS as appropriate.]

1. Yes - Project meets the above Categorical Exclusion criteria.
2. Yes - DNRC determination of Categorical Exclusion.
3. Yes - DNRC distributes the Notice of Determination.
4. Yes - Notice of Publication and cover letter (containing revocation language below) is delivered to recipient.
5. NA - Notice of Publication published in local newspaper by recipient and evidence of publication provided to reviewer.

(d) The department may revoke a categorical exclusion if:

[Only complete the steps below if revocation of a previously implemented CATEX becomes necessary.]

1. Choose an item. - The project is not initiated within the time period specified in the facility plan, or a new or modified application is submitted;
2. Choose an item. - The proposed action no longer meets the requirements for a categorical exclusion because of changes in the proposed action;
3. Choose an item. - New evidence demonstrates that serious local or environmental issues exist; or
4. Choose an item. - State, local, tribal, or federal laws may be violated.

Demi Blythe – CARDD MEPA Coordinator
DNRC CARD Division STATE PREPARER

Mark Bostrom – CARDD Administrator
DNRC CARD Division STATE REVIEWER

10/19/2021
COMPLETION DATE